

IN THE CLAIMS

The present listing of claims includes the status of all claims in the application, and replaces all previous listings of claims.

1. (Currently amended) In a blown film extrusion apparatus in which film is extruded as a tube from an annular die and then pulled along a predetermined path and located within an adjustable sizing cage, an apparatus for startup of said extruded film tube, comprising
positioning said adjustable sizing cage, comprising:
 - (a) means for varying a quantity of air within said extruded film tube, including:
 - (1) a supply blower which supplies air to said extruded film tube in an amount corresponding to a supply control signal, and
 - (2) an exhaust blower which exhausts air from said extruded film tube in an amount corresponding to an exhaust control signal;
 - (b) a controller member including executable program instructions which define at least one control routine for automatic and coordinated control of said means for varying during starting operation of said extruded film tube by directing a series of supply control signals to said supply blower and/or exhaust control signals to said exhaust blower;

- (c) a sizing cage subsystem surrounding said extruded film tube and including an electrically-actuable and controllable actuator for moving said sizing cage inward and outward relative to said extruded film tube;
- (d) ~~a at least one~~ first non-contact sensor for measuring a distance between said cage subsystem and said extruded tube;
- (e) ~~at least one additional second and third~~ non-contact sensors for measuring a diameter of said extruded tube;
- (f) wherein said executable program instructions include a cage position control routine which utilizes is capable of utilizing said sizing cage subsystem-to-tube distance to calculate control a location of said sizing cage subsystem when moving said sizing cage subsystem from a first position to a second position during startup and resizing of said extruded film tube.

2. (Currently amended) An apparatus for ~~startup of an extruded film tube,~~ positioning an adjustable sizing cage according to Claim 1, further comprising:

- (g) wherein said at least one additional sensor includes at least second and third non-contact sensors that are located in fixed positions equally spaced around said sizing cage subsystem.

3. (Currently amended) An apparatus for ~~startup of an extruded film tube,~~

positioning an adjustable sizing cage according to Claim 1, further comprising:

(g) wherein said at least one first non-contact sensor is mounted to a moving arm of said sizing cage subsystem, wherein movement of said sizing cage subsystem results in a corresponding movement of said first non-contact sensor.

4. (Cancelled)

5. (Cancelled)

6. (Currently amended) An apparatus for ~~startup of an extruded film tube,~~

positioning an adjustable sizing cage according to Claim 1, further comprising:

(g) wherein said cage position control routine further includes a cage positioning routine which utilizes is capable of utilizing said electrically-actuable and controllable actuator to reposition said sizing cage subsystem in response relative to a predetermined set point defining a finished product diameter.

7. (Currently amended) An apparatus for startup of an extruded film tube, positioning an adjustable sizing cage according to Claim 6, further comprising:

(h) wherein said cage position control routine includes operates non-simultaneously in at least the following two modes of operation:

(1) a forecast mode of operation wherein when said sizing cage subsystem is located more than a first a-relatively large distance from said predetermined set point, wherein during operation in said forecast mode said sizing cage subsystem-to-tube distance is allowed to vary beyond a second distance; and

(2) a contact mode of operation wherein when said sizing cage subsystem is located less than the first a-relatively small distance from said predetermined set point, wherein during operation in said contact mode said sizing cage subsystem-to-tube distance is maintained less than the second distance.

8. (Currently amended) An apparatus for startup of an extruded film tube, positioning an adjustable sizing cage according to Claim 7, further comprising:

(i) wherein, when said cage position control routine operates in during said forecast mode of operation, control signals are supplied to said controller by said cage position control routine which cause a movement of said sizing cage subsystem through a series of steps.

9. (Currently amended) An apparatus for startup of an extruded film tube, positioning an adjustable sizing cage according to Claim 7, further comprising:

(i) wherein during said contact mode of operation, said cage position control routine allows a user ~~is permitted~~ to introduce slight overage or underage values to said extruded film tube in order to slightly move said sizing cage subsystem inward or outward to over-squeeze or under-squeeze said extruded film tube.

10. (Currently amended) An apparatus for startup of an extruded film tube, positioning an adjustable sizing cage according to Claim 8, further comprising:

(j) wherein said blown film extrusion apparatus includes a ~~lay flat control system which provides-a~~ an additional control system for monitoring and adjusting a finished product diameter for said extruded film tube; and

(k) wherein during said forecast mode of operation, control signals are supplied, ~~to said controller~~ by said cage position control routine to said layflat additional control system, which ~~are inaccurate~~ misrepresent actual measurements of said finished product diameter for said extruded film tube, wherein said additional control system operates to change the size of said extruded film tube causing said sizing cage subsystem to predominantly control said layflat control system.

11. (Currently amended) An apparatus for startup of an extruded film tube, positioning an adjustable sizing cage according to Claim 8, wherein, during said forecast mode of operation, said cage position control routine operates so that said control signals are supplied to move said sizing cage subsystem, through said series of steps, to a desired the second position for said extruded film tube.

12. (withdrawn) A method of operating a blown film extrusion apparatus, in which film is extruded as a tube from an annular die and then pulled along a predetermined path and located within an adjustable sizing cage, comprising the steps of:

varying a quantity of air within the extruded film tube to cause the extruded film tube to maintain a desired diameter;

measuring a diameter of the extruded film using at least second and third non-contact sensors;

measuring a distance between the adjustable sizing cage and the extruded film using a first non-contact sensor, and generating a control signal proportional thereto;

within an automatic controller, utilizing the control signal to calculate a desired sizing cage position; and

driving an electrically driven actuator to position the sizing cage at the desired sizing cage position.

13. (withdrawn) The method of Claim 12, wherein the automatic controller operates in at least the following two modes of operation:

(1) a forecast mode of operation wherein the adjustable sizing cage is located a relatively large distance from a predetermined set point; and

(2) a contact mode of operation wherein the adjustable sizing cage is located a relatively small distance from the predetermined set point;

wherein during the forecast mode of operation, the automatic controller provides control signals to drive the electrically driven actuator to position the sizing cage, through a series of steps, to the predetermined set point.

14. (withdrawn) The method of Claim 13, wherein during the contact mode of operation, the automatic controller provides control signals to drive the electrically driven actuator to position the sizing cage a selected distance from the extruded film tube.

15. (withdrawn) The method of Claim 13, wherein an operator is permitted to introduce slight overage or underage values to the controller, wherein the controller drives the actuator to slightly move the sizing cage inward or outward to over-squeeze or under-squeeze the extruded film tube.

16. (new) An apparatus for positioning an adjustable sizing cage according to Claim 6, further comprising:

(h) wherein said cage position control routine is capable of operating non-simultaneously in at least the following two modes of operation:

- (1) a forecast mode of operation when said sizing cage subsystem is located more than a first distance from said predetermined set point, wherein during operation in said forecast mode said sizing cage subsystem-to-tube distance is allowed to vary beyond a second distance; and
- (2) a contact mode of operation when said sizing cage subsystem is located less than a third distance, which is less than the first distance, from said predetermined set point, wherein during operation in said contact mode said sizing cage subsystem-to-tube distance is maintained less than the second distance; and
- (3) further wherein, when, while operating in either said forecast mode or said contact mode, said sizing cage subsystem becomes located a distance from said predetermined set point which is less than said first distance and greater than said third distance, said cage position control routine remains operating in whichever of said modes it is currently in.

17. (new) An apparatus for positioning an adjustable sizing cage according to Claim 16, further comprising:

(i) wherein, when said cage position control routine operates in said forecast mode of operation, control signals are supplied to said controller by said cage position control routine which cause a movement of said sizing cage subsystem through a series of steps.

18. (new) An apparatus for positioning an adjustable sizing cage according to Claim 17, wherein said steps have a length approximately equal to one-half of said first distance.

19. (new) An apparatus for positioning an adjustable sizing cage according to Claim 8, wherein said steps have a length approximately equal to one-half of said first distance.

20. (new) An apparatus for positioning an adjustable sizing cage according to Claim 1, wherein said at least one first and said at least one additional sensors are mounted a fixed vertical distance apart.

21. (new) An apparatus for positioning an adjustable sizing cage according to Claim 20, wherein said at least one first sensor is mounted below said at least one additional sensor.

22. (new) An apparatus for positioning an adjustable sizing cage according to Claim 7, wherein, if the distance between said sizing cage subsystem and said extruded film becomes less than a predefined distance, said cage position control routine is capable of pausing movement of said sizing cage subsystem.